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October 8, 2015

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LOS ALAMOS, N.M., Oct. 8, 2015— New findings released today in the journal *Science* show substantial bodies of water likely existed on the surface of the planet in its early history—including long-lasting lakes that built up deposits at least 250-feet deep, and likely much deeper. The findings are based on analysis of images that were returned by NASA's Curiosity rover over a two-and-a-half-year period and show finely layered sediment in Gale crater, Curiosity's landing site, that could only have been deposited by water flows.

“Skeptics have often asserted that evidence of water on Mars could be attributed to ephemeral, local wet episodes,” said Roger Wiens, a scientist at Los Alamos National Laboratory who is a co-author on the paper. “But based on these images from Curiosity, we know that, in fact, Mars had a rainy and snowy environment billions of years ago for an extended period of time. We wouldn’t see the millions of layers of contiguous fluvial sediment otherwise.”

Before Curiosity landed on Mars in 2012, scientists proposed that Gale crater had filled with layers of sediments. Some hypotheses proposed that the sediments accumulated from wind-blown dust and sand, while others asserted that sediment layers were deposited in an ancient lake. Based on the new analysis, the latter hypothesis was correct: water helped to fill Gale Crater with sediment.

The findings build upon previous work that suggested ancient lakes on Mars and last month’s NASA announcement that water currently seeps to the surface on Mars.

Curiosity has been exploring Gale Crater, which is estimated to be between 3.6 and 3.8 billion years old, since August 2012. In mid-September 2014, the rover reached the foothills of Aeolis Mons—nicknamed Mount Sharp—a three-mile-high layered mountain, which sits in the middle of the crater today. Curiosity has been exploring the base of the mountain since then.

According to the paper, the layers of sediment are a result of water degrading the crater rim and infilling both the crater and an internal lake basin by at least 250 feet and likely hundreds of feet deeper, based on satellite data. “Just like the Mississippi delta deposits sediment over the years into the gulf coast, streams on Mars flowed into this lake and deposited sediment,” said Wiens. The lake is believed to have existed for thousands to millions of years.

The images used to analyze the data were taken by multiple cameras on NASA’s Curiosity rover, including one on the ChemCam, a rock-blasting laser designed by Wiens’ team at Los Alamos National Laboratory that allows scientists to analyze the make-up of Mars’ surface.

Despite these findings, scientists are still unsure about the original source of water that carried sediment into the crater. For flowing water to have existed on the surface, Mars must have had a thicker atmosphere and warmer climate than has been theorized. However, current models don’t show this.

At least some of the water may have been supplied to the lakes by snowfall and rain in the highlands of the Gale Crater rim. Some have theorized an ocean existed in the plains north of the crater, but that doesn’t explain how water managed to exist as a liquid for extended periods of time on the surface.

“We have tended to think of Mars as being simple,” said John Grotzinger, the former project scientist for Mars Science Laboratory at the California Institute of Technology in Pasadena, and lead author of the new report. “We once thought of the Earth as being simple, too. But the more you look into it, questions come up because you’re beginning to fathom the real complexity of what we see on Mars. This is a good time to go back to reevaluate all our assumptions. Something is missing somewhere.”

The paper, titled “Deposition, Exhumation, and Paleoclimate of an Ancient Lake Deposit, Gale Crater, Mars,” will appear in the October 9th issue of *Science*, a publication of the American Association for the Advancement of Science.

About NASA’s Science Laboratory Project (http://www.nasa.gov/msl)

NASA’s Mars Science Laboratory Project is using Curiosity to assess ancient habitable environments and major changes in Martian environmental conditions. NASA’s Jet Propulsion Laboratory, a division of Caltech, built the rover and manages the project for NASA’s Science Mission Directorate in Washington.

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of plutonium infrastructure and establishes a path forward.”